



Agricultural
Research
Service

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Influence of Cover Crops and Tillage on Nitrogen Availability

Why Does it matter?

Nitrogen (N) is one of the most important nutrients for crop production. Availability of N during a cropping season is influenced by management, soil and environmental factors. Understanding how these factors interact is important because efficient use of fertilizer N impacts crop production costs and losses of N to the environment can negatively impact water quality.

What was done?

Field and laboratory investigations were conducted to evaluate soil, cover crop, and tillage influences on N availability. Treatments included legume and non-legume cover crops and conventional and conservation tillage systems. The field research used in situ incubation of soil cores to determine N availability during the growing season. In the laboratory soil was incubated under controlled conditions. A model of N availability was developed based on cover crop and soil temperature.

What was found?

A rye cover crop reduced N availability 30 to 50% compared to a crimson clover cover crop in one study and by similar amounts when compared to oilseed radish and black oat in a second study. Crimson clover made available 30 to 50 lb N acre⁻¹ during the summer crop growing season which could help reduce N inputs from fertilizer. Nitrogen mineralization (or availability) was greater in soils with conservation tillage than with conventional tillage due to greater amounts of soil organic matter near the soil surface and more moist conditions. Our simple model made good predictions of N availability using soil temperatures and it worked well for different tillage and cover crop management systems. We are continuing to evaluate the model for use in managing N inputs in cotton systems.



What is the impact?

US farmers use nearly 13 million tons of N annually and the price has increased approximately 35% from 2003 to 2006. Further increases of 5 to 15% are expected in the future due to increased energy costs. Improving efficiency of N use by 10% could reduce inputs by 6 to 20 lb acre⁻¹ depending on the N demand of the crop which would help reduce fertilizer costs. Using legume cover crops would be one way to increase N inputs and increase N availability. Long-term use of conservation tillage appears to be another way to improve N use efficiency by increasing soil organic matter near the soil surface which serves as a reservoir of N and a mechanism to increase the efficiency of N cycling.

Research Team and Contact information

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